The Division Algorithm says: if \( a \in \mathbb{Z}, b \in \mathbb{N} \) then there are unique integers \( q \) and \( r \) with \( a = bq + r \), and \( 0 \leq r < b \).

\( q \) is the quotient and \( r \) is the remainder.

The greatest common divisor (gcd) of integers \( a \) and \( b \) (not both 0) is the largest natural number \( d \) such that \( d \) divides both \( a \) and \( b \).

We write: \( \gcd(a, b) = d \). By definition \( \gcd(a, b) \geq 1 \). If \( \gcd(a, b) = 1 \) we say that \( a \) and \( b \) are relatively prime.

The GCD Theorem says, given an integer \( a \) and positive integer \( b \),

\[
\gcd(a, b) = \min\{ak + bl : k, l \in \mathbb{Z}, ak + bl > 0\}
\]

Euclid’s Lemma says that if \( p \) is a prime, and \( a, b \) are integers and \( p|ab \) then either \( p|a \) or \( p|b \).

1. Find \( \gcd(5, 6) \).

2. Find integers \( k, l \) such that \( \gcd(5, 6) = 5k + 6l \).

3. Find \( \gcd(10, 12) \).

4. Find integers \( k, l \) such that \( \gcd(10, 12) = 10k + 12l \).